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## CC –BY Knowledge of fever in children and its management among health workers in a tertiary hospital in South-east Nigeria

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**Abstract:** *Introduction:* Fever is an adaptive response and a common symptom of diseases in children. Caregivers rely largely on the different cadre of health care workers (HCW) for the management of fever. This study sought to determine the knowledge and management of fever in children among HCWs in a tertiary health facility.

*Materials and methods:* Self-administered questionnaires were used for this descriptive cross-sectional study carried out over 8 weeks.

*Results:* A total number of 165 HCWs participated in the study with a median work experience of 8 years. One hundred and twenty-three (74.5%) had managed a febrile child, predominantly medical doctors (85.3%) and nurses (75%) ( $p=0.006$ ). Almost all the HCWs (92.1%) used mercury thermometer to assess body temperature, but only 58.2% rightly placed the thermometer in the axilla for 3 to 5 minutes before reading it, ( $p<0.0001$ ). Significant majority

of the HCWs (93.3%) recommended antipyretics to a child they assessed to have fever, while less than half (45.5%) recommended tepid sponging. All the medical doctors recommended antipyretics but were least to recommend tepid sponging, ( $p<0.0001$ ). Antipyretics were recommended at a low temperature threshold of  $<38.5^{\circ}\text{C}$ , and oral acetaminophen alone (44.2%) and in combination with oral ibuprofen (44.8%) were most commonly recommended. The recommended dose of these antipyretics varied, being rightly prescribed by 66.2% (oral acetaminophen) and 35.1% (oral ibuprofen) of the HCWs.

*Conclusion:* The knowledge of and management of fever in children among health care providers were inconsistent in this study. A positive outcome can be achieved through regular re-training programs and focused research.

**Keywords:** knowledge, practice, management, fever, children, health, workers, NAUTH

### Introduction

Fever is a physiologic response to infection, characterized by a rise of the body temperature above normal daily variation.<sup>1</sup> The increase in body temperature is associated with a reduction in microbial replication and as a result helps to limit the spread of the infection.<sup>2</sup> Fever is defined based on the part of the body the temperature was obtained.<sup>3</sup> Due to high health costs coupled with poverty in our environment, as well as hurdles experienced in obtaining health care from hospitals, caregivers tend to seek care from HCWs other than paediatricians for their child's health needs. However, a number of these HCWs do not have the requisite knowledge required to manage fever.<sup>4,5</sup> Edwards *et al*,<sup>4</sup> reported a suboptimal knowledge on fever among nurses while Demir *et al*,<sup>5</sup> described that even among physicians, there are a lot of misconceptions about the management and complications of fever. Such suboptimal practices

result in a fever phobia in caregivers which may result to drug over dose, side effects of the medications and delay in seeking proper care.<sup>6</sup> A dearth of data on knowledge and management of fever in children by HCWs in our environment exists.

### Materials and methods

This was a cross-sectional descriptive study carried out at the Nnamdi Azikiwe University Teaching Hospital (NAUTH), Nnewi between July and August of 2017. NAUTH is one of the two tertiary hospitals in Anambra State with four outstations. At the time of study, there were 528 medical doctors, 509 nurses, 42 pharmacists and 98 medical laboratory scientists employed at NAUTH.<sup>7</sup> Proportionate sampling was used to arrive at the number of participants to be recruited from the dif-

ferent cadres of the study population. One hundred and sixty-five health care workers were recruited using a self-administered questionnaire. Ethical approval was obtained from the NAUTH Ethical Review Committee. A subject information/consent form was administered, and only HCWs who consented were recruited. The data was cleaned and entered into Statistical Package for Social Sciences (SPSS) version 23 Chicago, IL for analysis. Continuous variables that were not normally distributed were expressed as median. Categorical variables were compared for association as appropriate using contingency tables such as chi-square ( $\chi^2$ ) or Fischer's exact analysis. The p-value was considered statistically significant at 0.05.

## Results

A total of 165 health care workers (HCW) were studied with M:F of 1.1:1. The median age was 36 years with a range of 22 to 59 years. Doctors (41.2%) and nurses (33.9%) constituted three-quarter of the cohort. The median year of practice was 8 years, ranging from 1 to 38 years. (Table 1).

Only 55 (33.3%) of the HCWs knew that the thermometer was the most reliable means of assessing temperature while the rest believed that temperature can be assessed reliably by palpation and the use of thermometer. Majority of those who knew that thermometer was the only reliable means were pharmacists (47.6%) and medical

doctors (35.3%) which was statistically significant,  $p=0.001$ . The axilla (93.9%) was the most common site known by the HCWs for checking a child's temperature while the least known site was the ear (44.8%). Significantly higher number of the medical doctors knew that the sites for checking a child's temperature were rectum (95.6%), mouth (94.1%), axilla (100%), ear (86.8%),  $p<0.0001$ . Ninety-seven (58.8%) of the HCW knew that the rectum was the best site for assessing temperature, and a significantly higher number of medical doctors (91.2%) are aware of this,  $p<0.0001$ . Majority of the HCWs (95.8%) had the knowledge that the axilla was the routinely recommended site for assessing a child's temperature (Table 2).

**Table 1:** Demographic characteristics of the HCWs

Demographic variable	Frequency (n=165)	Percent
<i>Age (years)</i>		
21-30	46	27.9
31-40	72	43.6
41-50	28	17.0
51-60	19	11.5
<i>Sex</i>		
Male	87	52.7
Female	78	47.3
<i>Profession</i>		
Medical Doctor	68	41.2
Nurse	56	33.9
Pharmacist	21	12.7
Medical lab scientist	20	12.1
<i>Years of practice</i>		
0-5	55	33.3
>5 -10	54	32.7
>10	56	33.9

**Table 2 :** Knowledge of fever by profession (1)

Response`	Total n=165 n (%)	Doctors n=68 n (%)	Nurses n=56 n (%)	Lab sci n=20 n (%)	Pharm n=21 n (%)	P-value
<i>Means of reliably assessing temp.</i>						0.001
Feeling the skin	13 (7.9)	1 (1.5)	2 (3.6)	5 (25.0)	5 (23.8)	
Use of thermometer	55 (33.3)	24 (35.3)	16 (28.6)	5 (25.0)	10 (47.6)	
Both	97 (58.8)	43 (63.2)	38 (67.9)	10 (50.0)	6 (28.6)	
<i>Sites that can be used<sup>†</sup></i>						<0.0001
Rectum	134(81.2)	65 (95.6)	41 (73.2)	12 (61.9)	13 (61.9)	
Mouth	131(79.4)	64 (94.1)	36 (64.3)	17 (85.0)	17 (81.0)	
Axilla	155(93.9)	68 (100.0)	54 (96.4)	16 (80.0)	17 (81.0)	
Ear	74 (44.8)	59 (86.8)	5 (8.9)	5 (25.0)	5 (23.8)	
<i>Best site to use</i>						<0.0001
Rectum	97 (58.8)	62 (91.2)	20 (35.7)	7 (35.0)	8 (38.1)	
Mouth	14 (8.5)	2 (2.9)	10 (17.9)	1 (5.0)	1 (4.8)	
Axilla	49 (29.7)	2 (2.9)	25 (46.4)	10 (50.0)	11 (52.4)	
Ear	5 (3.0)	2 (2.9)	0 (0.0)	2 (10.0)	1 (4.8)	
<i>Site recommended routinely</i>						0.026
Axillary	158(95.8)	67 (98.5)	55(98.2)	17 (85.0)	19 (90.5)	
Others <sup>‡</sup>	7 (4.2)	1 (1.5)	1 (1.8)	3 (15.0)	2 (9.5)	

In bold are the correct answers according to NICE guideline and significant p-values. <sup>†</sup>Multiple response answers. <sup>‡</sup>Others: rectal, oral and aural

Only 96 (58.2%) were aware that the mercury thermometer was to be left for 3 to 5 minutes in the axilla before being read. Nearly two-thirds (69.1%) of the medical doctors had this knowledge, and about two-thirds (66.1%) of the nurses believed that the mercury thermometer was read in less than 3 minutes. This relationship was statistically significant,  $p < 0.0001$ . Axillary temperature  $37.5^{\circ}\text{C}$  was

correctly regarded as fever by only 97 (58.8%) of HCWs, and a significantly higher number of those who had this knowledge were the medical doctors [ $n=54/68$  (79.4%)],  $p < 0.0001$ . The most common complications of fever in children identified by the HCWs were seizure (96.3%) and dehydration (89.1%) (Table 3).

**Table 3: Knowledge of fever by profession (2)**

Response`	Total n=165 n (%)	Doctors n=68 n (%)	Nurses n=56 n (%)	Lab sci n=20 n (%)	Pharm n=21 n (%)	P-value
<i>How long is mercury thermometer left in axilla before reading?</i>						
< 3mins	67(40.6)	20 (29.4)	37 (66.1)	4 (20.0)	6 (28.6)	<0.000 1
3-5 mins	96 (58.2)	47 (69.1)	19 (33.9)	15(75.0)	15 (71.4)	
>5 mins	2 (1.2)	1 (1.5)	0 (0.0)	1 (5.0)	0 (0.0)	
<i>Axillary temp defined as fever</i>						
37.0°C	45(27.3)	4 (5.9)	15 (26.8)	13 (65.0)	13 (61.9)	<0.000 1
37.5 °C	97 (58.8)	54 (79.4)	33 (58.9)	4 (20.0)	6 (28.6)	
38.0 °C	23 (13.9)	10 (14.7)	8 (14.3)	3 (15.0)	2 (9.5)	
<i>Complications of fever<sup>†</sup></i>						
Seizures	159 (96.3)	68 (100.0)	52 (92.9)	18 (90.0)	19 (90.5)	0.003
Dehydration	152 (89.1)	63 (92.6)	51 (92.9)	20 (100.0)	15 (71.4)	
Hallucination	88 (53.7)	35 (51.5)	31 (55.4)	13 (65.0)	9 (42.9)	
Mental retardation	79 (48.2)	26 (38.2)	28 (50.0)	11 (55.0)	14 (66.7)	
Others <sup>‡</sup>	6 (3.6)	0 (0.0)	4 (7.1)	2 (10.0)	0 (0.0)	

In bold are the correct answers and significant p-values.

<sup>†</sup>Multiple response answers. <sup>‡</sup>Others: anaemia, epistaxis, loss of consciousness, timidity

Out of the 165 HCWs, 123 (74.5%) had managed a child with fever in the past. Majority of those who had done this were the medical doctors (85.3%) and the nurses (75%) which was statistically significant ( $p=0.006$ ). Although many of the HCWs (92.1%) made use of the mercury thermometer for measurement of a child's temperature, only 96 (58.2%) read

the thermometer after 3 to 5 minutes in the axilla. A significantly lower number of the medical doctors ( $n=47$ , 69%) and nurses ( $n=19$ , 33%) practiced this compared to the medical lab scientists ( $n=15$ , 75%) and pharmacists ( $n=15$ , 71.4%),  $p < 0.0001$  as shown on table 4.

**Table 4: Management of fever in children by profession (1)**

Response	Total n=165 n (%)	Doctors n=68 n (%)	Nurses n=56 n (%)	Lab sci n=20 n (%)	Pharm n=21 n (%)	P-value
<i>Have you ever managed a child with fever?</i>						
Yes	123 (74.5)	58 (85.3)	42 (75.0)	10 (50.0)	13 (61.9)	0.006
No	42 (25.5)	10 (14.7)	14 (25.0)	10 (50.0)	8 (38.1)	
<i>What site do you usually use to detect fever?</i>						
Axillary	158 (95.8)	67 (98.5)	54 (96.4)	17 (85.0)	20 (95.2)	0.15
Others	7 (4.2)	1 (1.5)	2 (3.6)	3 (15.0)	1 (4.8)	
<i>What device do you frequently use to check axillary temperature?</i>						
Mercury thermometer	152 (92.1)	64 (94.1)	55 (98.2)	17 (85.0)	16 (76.2)	0.007
Electronic thermometer	13 (7.9)	4 (5.9)	1 (1.8)	3 (15.0)	5 (23.8)	
<i>How long do you leave mercury thermometer in axilla before reading?</i>						
< 3mins	67(40.6)	20 (29.4)	37 (66.1)	4 (20.0)	6 (28.6)	<0.000 1
3-5 mins	96 (58.2)	47 (69.1)	19 (33.9)	15(75.0)	15 (71.4)	
>5 mins	2 (1.2)	1 (1.5)	0 (0.0)	1 (5.0)	0 (0.0)	

In bold are the correct answers and significant p-values

Majority of the HCWs (93.3%) recommended antipyretics to control fever in a child while only 75 (45.5%) recommended tepid sponging. Most of those who recommended antipyretics were the medical doctors (100%), pharmacists (90.5%) and medical lab scientists (90%). Tepid sponging was least recommended by the medical doctors (30.9%) and nurses (50%),  $p < 0.0001$ . About a third of the HCWs (33.3%) recommended antimalarials for fever. Only 25 (15.2%) HCWs correctly recommended antipyretics at an axillary temperature of  $38.5^{\circ}\text{C}$ , while majority (70.9%) recommended antipyretics at axillary temperature  $< 38.5^{\circ}\text{C}$ . Four (2.4%) HCWs recommended antipyretics based on how uncomfortable the child felt, not considering the degree of fever.

A significantly higher number of the nurses ( $n=15$ , 26.8%) recommended antipyretics at an axillary temperature of  $38.5^{\circ}\text{C}$ , while a higher number of the medical doctors ( $n=61$ , 89.7%) had a lower temperature threshold ( $37.5^{\circ}\text{C}$ ) for recommending antipyretics,  $p < 0.0001$ . As shown on table 5, 68 (44.2%) HCWs recommended only oral paracetamol (PCM) while 69 (44.8%) recommended both oral PCM and oral ibuprofen for a febrile child. Aspirin was recommended by 14 (9.1%) of HCWs. A significantly higher number of the medical doctors frequently recommended oral PCM only (33.8%) and oral PCM plus ibuprofen (48.5%),  $p=0.009$ . Only the medical doctors (16.2%) and nurses (6.1%) recommended aspirin (Table 4).

**Table 5:** Management of fever in children by profession (2)

Response	Total n=165 n (%)	Doctors n=68 n (%)	Nurses n=56 n (%)	Lab sci n=20 n (%)	Pharm n=21 n (%)	P-value
<i>Methods you recommend to control fever<sup>†</sup></i>						
Tepid sponge	75 (45.5)	21 (30.9)	28 (50.0)	13 (65.0)	13 (61.9)	
Bath with cold water	28 (17.0)	4 (5.9)	16 (28.6)	6 (30.0)	2 (9.5)	
Antipyretics	154 (93.3)	68 (100.0)	49 (87.5)	18 (90.0)	19 (90.5)	$< 0.000$
Antibiotics	20 (12.1)	15 (22.1)	3 (5.4)	0 (0.0)	2 (9.5)	1
Antimalarials	55 (33.3)	20 (29.4)	20 (35.7)	7 (35.0)	8 (38.1)	
Drink fluids	28 (17.0)	1 (1.5)	18 (32.1)	3 (15.0)	6 (28.6)	
<i>At what axillary temp do you recommend antipyretics?</i>						
37.2°C	19 (11.5)	1 (1.5)	8 (14.3)	3 (15.0)	7 (33.3)	
37.5 °C	117 (70.9)	61 (89.7)	32 (57.1)	13 (65.0)	11 (52.4)	$< 0.000$
38.5 °C	25 (15.2)	4 (5.9)	15 (26.8)	3 (15.0)	3 (14.3)	1
Based on child's discomfort	4 (2.4)	2 (2.9)	1 (1.8)	1 (5.0)	0 (0.0)	
<i>What antipyretic(s) do you recommend most frequently? (n=154)</i>						
Oral PCM	68(44.2)	23 (33.8)	25(51.0)	11 (61.1)	9(47.4)	
Oral Ibuprofen	3(1.9)	1(1.5)	0 (0.0)	2 (11.1)	0 (0.0)	0.009
Oral PCM and Ibuprofen	69 (44.8)	33(48.5)	21(42.9)	5(27.8)	10 (52.6)	
Oral PCM and aspirin	14 (9.1)	11 (16.2)	3 (6.1)	0 (0.0)	0 (0.0)	

In bold are the correct answers and significant p-values

Amongst the HCWs who recommended antipyretics, only 102 (66.2%) recommended the right dose of oral PCM (10-15mg/kg). A significant majority of the pharmacists ( $n=18$ , 94.7%) and doctors ( $n=49$ , 72.1%) recommended the right dose,  $p=0.010$ . Likewise, among the 54 (35.1%) HCWs who recommended the right dose of oral ibuprofen (5-10mg/kg), a significant majority were the medical doctors (45.6%) and pharmacists (36.8%),  $p < 0.0001$ . Only 13 (8.5%) HCWs who recommended antipyretics, prescribed the right maximal dose

of oral PCM (90mg/kg/day) for the children they managed. More than half of the medical doctors (54.4%) and pharmacists (57.9%) recommended oral PCM with a high maximal dose, while a significant proportion of the nurses (45.9%) and medical lab scientists (44.5%) who recommended oral PCM had no knowledge of the maximal dose,  $p < 0.0001$ . Also only 14 (9.3%) of these HCWs recommended the right maximal dose of oral ibuprofen (30mg/kg/day). Among those who recommended the right maximal dose, pharmacists were relatively higher in number ( $n=4$ , 21.1%). This was statistically significant ( $p < 0.0001$ ). Table 6.

**Table 6:** Management of fever in children by profession (3)

Response	Total n=154 n (%)	Doctors n=68 n (%)	Nurses n=49 n (%)	Lab sci n=18 n (%)	Pharm n=19 n (%)	P-value
<i>What dose of oral PCM do /would you recommend?</i>						
<10mg/kg	28 (18.2)	13 (19.1)	11 (22.4)	3 (16.7)	1 (5.3)	0.010
10-15mg/kg	102 (66.2)	49 (72.1)	25 (51.0)	10 (55.6)	18 (94.7)	
>15mg/kg	2 (1.3)	1(1.5)	1 (2.0)	0 (0.0)	0 (0.0)	
Not sure	22 (14.3)	5 (7.4)	12 (24.5)	5 (27.8)	0 (0.0)	
<i>What dose of oral Ibuprofen do/ would you recommend?</i>						
<1-5mg/kg	24 (15.6)	7 (10.3)	14 (28.6)	3 (16.7)	0 (0.0)	<0.0001
5-10 mg/kg	54 (35.1)	31 (45.6)	10 (20.4)	6 (33.3)	7 (36.8)	
10-15mg/kg	20 (13.0)	6 (8.8)	2 (4.1)	1 (5.6)	11 (57.9)	
>15 mg/kg	5 (3.2)	0 (0.0)	4 (8.2)	1 (5.6)	0 (0.0)	
Not sure	51 (33.1)	24 (35.3)	19 (38.8)	7 (38.9)	1 (5.3)	
<i>What is the maximum dose of PCM you recommend?</i>						
50mg/kg	35 (22.9)	11 (16.2)	17 (35.4)	4 (22.2)	3 (15.8)	<0.0001
90mg/kg	13 (8.5)	5 (7.4)	5 (10.4)	1 (5.6)	2 (10.5)	
120mg/kg	57 (37.3)	37 (54.4)	4 (8.3)	5 (27.8)	11 (57.9)	
Don't know	48 (31.3)	15 (22.0)	22 (45.9)	8 (44.5)	3 (15.8)	
Missing	1(0.6)					
<i>What is the maximum dose of Ibuprofen you recommend?</i>						
30mg/kg	14 (9.3)	5 (7.8)	3 (6.1)	2 (11.1)	4 (21.1)	<0.0001
50mg/kg	49 (32.7)	33 (51.6)	3 (6.1)	3 (16.7)	10 (52.6)	
100mg/kg	18 (12.0)	1 (1.6)	13 (26.5)	2 (11.1)	2 (10.5)	
Don't know	69 (44.0)	25 (39.1)	30 (61.2)	11 (61.2)	3 (15.8)	
Missing	4 (2.4)					

In bold are the correct answers and significant p-values

## Discussion

In this study, majority (74.5%) of the HCWs studied had managed children with fever. This agrees with a systematic review which revealed that different health care professionals were involved in managing febrile children.<sup>8</sup> Competence of HCWs in managing a febrile child will therefore depend on their knowledge. There was inconsistent knowledge of fever management among the different HCWs. Only 58.8% knew that axillary temperature 37.5°C was defined as fever. Body temperature of a child regarded as fever by the HCWs ranged from 37°C to 38.5°C, and this varied even amongst HCWs with the same profession. Definition of fever by HCWs also varied significantly in other studies.<sup>5,9</sup> The varied figures for fever definition obtained in this study may perhaps be as a result of absence of a national guideline on fever management peculiar to children.

A significant majority of HCWs (92.1%) preferred to check the axillary temperature using a mercury thermometer, contrary to reports from foreign studies where electronic thermometers were most commonly used.<sup>5,9</sup> Mercury thermometer is cheaper than electronic thermometer, and this could underscore its common use in a resource poor country like Nigeria. However, only about half of HCWs rightly took the reading on the thermometer after > 3mins of placement in the axilla. Nurses most commonly read the mercury thermometer in less than 3 minutes. The short duration of mercury thermometer placement may lead to false normothermia. This practice is worrisome as it may lead to delay in starting treatment

for the underlying ailment. Furthermore, the nurses are charged with the responsibility of patient monitoring, hence it is pertinent that they obtain the right temperature as it could help to ascertain the progress of a patient. Consequently, the National Institute for Health and Care Excellence (NICE) guideline as well as the Italian Paediatric Society (IPS) recommend the use of electronic thermometers.<sup>2,10</sup>

Majority of HCWs recommended antipyretics, and most did so for a temperature less than 38.5°C. Other studies also reported a high recommendation of antipyretics for febrile children.<sup>5,9</sup> This may be the consequence of fever phobia. Fever is associated with a reduction in microbial replication and as a result helps to limit the spread of the infection.<sup>[2]</sup> As a result, the NICE and IPA guidelines recommend that antipyretics should not be given to febrile children just to reduce the temperature except there is a sign of discomfort or irritability.<sup>2,10</sup> This is contrary to the recommendation by the Standard Treatment Guidelines for Nigeria last updated in 2008, whose main objective is to lower the temperature.<sup>11</sup> Aspirin which is not recommended in children less than 16 years as a result of Reye syndrome,<sup>2,10,11</sup> was preferred by few of the HCWs, particularly the medical doctors and nurses. Oral PCM only and oral PCM plus oral ibuprofen were the antipyretics most commonly prescribed by the HCWs as was also reported by Demir *et al.*<sup>3</sup> There is no recommendation regarding the use of oral ibuprofen in Nigeria guideline for the management of fever.<sup>11</sup> While the NICE guideline and Paracetamol plus Ibuprofen for Treatment of fever in Children (PITCH) trial allowed alternating PCM and Ibuprofen, the IPA guideline do not as they assume it is less safe and not more efficacious.<sup>2,10,12</sup> It was found in this study that majority of HCWs, most especially the nurses do not know the right

or maximal dose of oral PCM and oral ibuprofen, a finding also reported by Rafaeliet *al.*<sup>10</sup> This could lead to under or overdosing of children with resultant side effects. While the NICE and IPA guidelines recommended the right doses of these drugs per kilogram body weight with a maximal dose, the Nigerian guideline made no clear specification.<sup>2,10,11</sup>

### Conclusion/ Recommendation

There was generally a poor knowledge and inconsistent practice of fever management among HCWs who care for children. There is a need to develop a clear national guideline specific for the management of fever in children. There is also a need to educate HCWs on the correct management of fever in children as it is a common symptom and many primary caregivers seek care/ counsel from them.

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